REMARKS

Claims 1-8 and 11-13 are pending in this application. Claim 1 has been amended to incorporate the subject matter of claim 14, which has been canceled herein. **The incorporation of subject matter from dependent claim 14 raises no new issues requiring further search or consideration. Accordingly, the present Amendment should be entered.**

Claims 1-8 and 11-13 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Partridge et al. (U.S. Patent No. 4,820,402) ("Partridge") in view of Gentry (U.S. Patent No. 6,261,441) ("Gentry"). This rejection is respectfully traversed and reconsideration is respectfully requested.

Claim 1 has been amended herein to incorporate the subject matter of claim 14, which is not rejected over the combination of Partridge and Gentry. Accordingly, Applicants respectfully submit that claim 1, along with dependent claims 2-8 and 11-13, is allowable over the cited combination. Applicants respectfully request the rejection be withdrawn and the claims allowed.

Claims 1-8 and 11-14 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Partridge in view of Fragelli et al. (U.S. Patent No. 6,103,101) ("Fragelli"). This rejection is respectfully traversed and reconsideration is respectfully requested.

Claim 1 recites a "process for preparation of middle distillates by selective conversion of a hydrocarbon containing feedstock under hydrocracking conditions with a hydrocarbon conversion catalyst comprising one or more hydrogenation components supported on a support comprising a beta zeolite and an amorphous inorganic oxide, the beta zeolite having a SiO_2: Al_2O_3 molar ratio of at least 50, and the amorphous inorganic oxide consisting of silica-alumina and alumina and combinations thereof, the support having an Ion Exchange Capacity-Acidity Index of less than 3.7, the support comprising less than 15 wt % zeolite beta."

Applicants respectfully submit that, even if combined, the cited references do not disclose all features of the claimed invention. Specifically, the combination does not disclose a

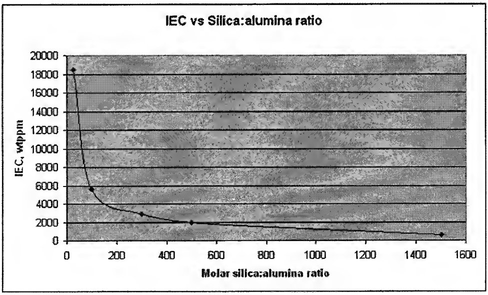
catalyst support having the combination of a "beta zeolite having a SiO_2: Al_2O_3 molar ratio of at least 50" and "having an Ion Exchange Capacity-Acidity Index of less than 3.7." Applicants respectfully submit that, contrary to the Examiner's assertion, the mere recitation of a silica:alumina ratio allegedly overlapping that of the claims does not necessarily correlate to an overlap of IEC-AI values.

As discussed in the present application, the IEC-AI of the catalyst support used in the invention is calculated according to the following formula:

$$\text{IEC-AI} = \frac{(\text{wt ppm Na}) \times (\text{zeolite content in catalyst support, wt\%})}{(\text{wt ppm Na in standard zeolite beta}) \times (1\ \text{wt\%})}$$

Specification, pg. 24, lines 1-3.

The IEC of the standard beta zeolite having a silica:alumina ratio of 25 is 18500 wt ppm sodium. Specification, pg. 23, lines 27-30. As can be taken from the examples of the present application, beta zeolites having a silica:alumina ratio of 1500, 500, 300 or 100 have an IEC value of 630, 2000, 2870 or 5630 wt ppm sodium, respectively. See, Specification, pg. 24, line 7 – pg. 26, line 4. A correlation of silica:alumina ratio to IEC values based on this data is shown in the following graph:



The Catalyst B used in Example 11 of Partridge, referenced by the Examiner, is a hydrocracking catalyst comprising a hydrogenation component (Ni-W) supported on a support comprising a beta zeolite and an amorphous inorganic oxide (gamma alumina), the beta zeolite having a silica:alumina ratio of 30. The Examiner states that Partridge "does not recite the percentage of zeolite in the support matrix." Office Action, pg. 3. However, Applicants note that Partridge clearly describes that Catalyst B used in Example 11 is prepared by mixing the zeolite with an equal amount of gamma alumina. Partridge, col. 12, line 66 – col. 13, line 4. Thus, the support of catalyst B used in Example 11 consists of 50 wt% beta zeolite (with a silica:alumina ratio of 30) and 50 wt% gamma alumina.

Based on the correlation of silica:alumina ratio to IEC values shown in the chart above, the beta zeolite having a silica:alumina ratio of 30 used in Example 11 of Partridge has an IEC of about 17000 wt ppm sodium. Accordingly, the IEC-AI of the support of catalyst B used in Example 11 can be calculated to be:

$$\text{IEC-AI} = \frac{(\text{about } 17000 \text{ wt ppm Na}) \times (50 \text{ wt\%})}{(18500 \text{ wt ppm Na}) \times (1 \text{ wt\%})} = \text{about } 46$$

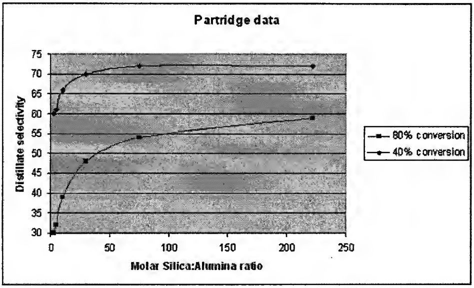
Consequently, the support of catalyst B used in Example 11 of Partridge clearly does not have the claimed IEC-AI of less than 3.7.

The Examiner further alleges that Partridge teaches zeolites having a silica:alumina ratio of at least 50 such as 100 or 200, which would meet the claimed limitation. See, Office Action, pgs. 3-4. Applicants note, however, that although Partridge discloses silica:alumina ratios of up to even 500 (col. 8, lines 16 to 19), when using a support with a zeolite content of 50 wt% (as taught in the experimental portion of Partridge), the IEC-AI would be at least about 5.4[1] even with a silica:alumina ratio of 500, which does not meet the required claim limitation of having an IEC-AI of 3.7 or less. In order to obtain a catalyst support including 50 wt% beta zeolite and having an

[1] $\text{IEC-AI} = \frac{(2000 \text{ wt ppm Na}) \times (50 \text{ wt\%})}{(18500 \text{ wt ppm Na}) \times (1 \text{ wt\%})} = 5.4$

IEC-AI of 3.7 or less, one would have to select a beta zeolite having a silica:alumina ratio of at least about 800.[2] Applicants respectfully submit, however, that selecting a beta zeolite having this high a silica:alumina ratio is not fairly suggested by Partridge.

The sole figure in Partridge illustrates distillate selectivity in percent (y-axis) as a function of the silica:alumina ratio (x-axis) at different zeolite contents. The same figure, entitled "Partridge data" is included below with an x-axis which has been expanded in order to obtain a true picture of the variation in selectivity at different silica:alumina ratios.



As can be seen from this figure, there is virtually no improvement in selectivity at ratios above approximately 100, and therefore there would be no advantage in increasing the silica:alumina ratios above a certain amount, and especially not to values as high as 800.

Therefore, Applicants submit that Partridge fails to disclose or suggest a support which has the claimed combination of a "beta zeolite having a SiO_2: Al_2O_3 molar ratio of at least 50" and

[2] Similarly, in order to obtain a catalyst support including 50 wt% beta zeolite and having an IEC-AI of 2.7 or less (as recited in dependent claim 3), one would have to select a beta zeolite having a silica:alumina ratio of at least about 1200.

an IEC-AI of less than 3.7. Fragelli does not remedy this deficiency of Partridge. Therefore, even if combined, the references do not disclose all features of the claims.

Further, as the Examiner concedes, Partridge does not disclose the "support comprising less than 15 wt % zeolite beta." The Examiner asserts that Fragelli discloses this feature stating, specifically, that Fragelli discloses that the "catalyst can have crystallinity ranging from 1 to 25%." Office Action, pg. 5. Firstly, Applicants note that the term "crystallinity weight percentage" in col. 7, lines 41 to 43 referred to by the Examiner is not clearly defined in the description (i.e., it is not clear to what it refers) and has no scientific meaning in the art. It is not readily apparent from Fragelli or the relevant prior art whether or not "crystallinity weight percentage" of zeolite refers to the wt % of zeolite present in the support. Moreover, Fragelli is silent as regards the zeolite content of the support and merely provides information about the zeolite content of the catalyst itself.

Furthermore, Fragelli merely generalizes regarding the zeolites used and does not actually disclose the use of a beta zeolite, as claimed by the Examiner. Fragelli teaches that the zeolite unit cell size should be between 2.435 and 2.455 nm (i.e., between 24.35 and 24.55 Å). See, Fragelli, col. 7, lines 42-44; Example 1. Beta zeolite (Framework Type BEA), on the other hand, has unit cell size a, b equal to 12.632 Å, and c equal to 26.186 Å.[3] This shows that the cell size disclosed in Fragelli is completely different from that of beta zeolite. Consequently, Fragelli does not disclose, and in fact excludes, the use of beta zeolite. The cell size given in Fragelli seems to be that of zeolite Y (Framework Type FAU).

Applicants further submit that, in any event, one of skill in the art would not have been motivated to combine the references in the manner asserted by the Examiner. Fragelli is directed to the preparation of lube oils (by a process in which four catalysts are used in series, including an isomerization/hydrocracking catalyst), which would not be considered a middle distillate by one of skill in the art.[4] Fragelli discloses a different process using a different support and thus a different

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[3] See the attached electronic extract obtained from the International Zeolite Association's website (URL: http://www.iza-structure.org/databases).

[4] Attached is a list showing the boiling point range of lube oils (>400°C) as compared to middle distillates which are a mixture of heavy naphtha, kerosene, and light and heavy gas oil (150-425°C).

catalyst leading to other products than the process in Partridge and in the application. Therefore, there would be no motivation for the skilled person to combine the teachings of Partridge and Fragelli.

Accordingly, Applicants respectfully submit that claim 1 is allowable over the cited combination. Claims 2-8 and 11-13 depend from claim 1 and are allowable along with claim 1. Applicants respectfully request that the rejection be withdrawn and the claims allowed.

In view of the above, Applicants believe the pending application is in condition for allowance.

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Respectfully submitted,

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Attachments:
* Electronic extract obtained from the International Zeolite Association's website (URL: http://www.iza-structure.org/databases).
* Boiling point list (referenced in FN3)

Framework Type *BEA

Framework

Space Group: $P4_122$

Cell Parameters:

a = 12.632 Å	b = 12.632 Å	c = 26.186 Å
α = 90.000 °	β = 90.000 °	γ = 90.000°
Volume =	4178.43 $Å^3$	
R_{DLS} =	0.0022	

Framework density (FD_{Si}): 15.3 T/1000 $Å^3$

Topological density: TD_{10} = 805 TD = 0.704545

Ring sizes (# T-atoms) 12 6 5 4

Channel system: 3-dimensional

Secondary Building Units: combinations only

Composite Building Units:


mor


bea


mtw

Coordinates: List (T-atoms), CIF (T and O atoms)

Coordination sequences: List
+ Vertex symbols
+ Loop configurations

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*The asterisk in the code indicates that Beta is

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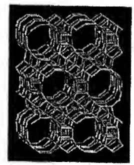
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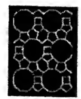
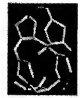


disordered. The most representative polymorph (A) has been selected as the Framework Type. For more information see *BEA family under "Disordered Structures".

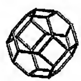


Framework Type FAU

Framework

Space Group:	Fd-3m (origin choice 2)	
Cell Parameters:		
a = 24.345 Å	b = 24.345 Å	c = 24.345 Å
α = 90.000°	β = 90.000°	γ = 90.000°
Volume =	14428.77 $Å^3$	
R_{DLS} =	0.0009	
Framework density (FD_{Si}):	13.3 T/1000 $Å^3$	
Topological density:	TD_{10} = 579	TD = 0.476190
Ring sizes (# T-atoms)	12 6 4	
Channel system:	3-dimensional	
Secondary Building Units:	6-6 or 6-2 or 6 or 4-2 or 1-4-1 or 4	
Composite Building Units:		

d6R



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Coordinates:	List (T-atoms), CIF (T and O atoms)
Coordination sequences:	List
+ Vertex symbols	
+ Loop configurations	
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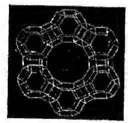

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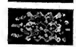

General Boiling Fractions of Petroleum.

Fraction	Boiling range[a]	
	°C	°F
Light naphtha	−1–150	30–300
Gasoline	−1–180	30–355
Heavy naphtha	150–205	300–400
Kerosene	205–260	400–500
Stove oil	205–290	400–550
Light gas oil	260–315	400–600
Heavy gas oil	315–425	600–800
Lubricating oil	> 400	> 750
Vacuum gas oil	425–600	800–1100
Residuum	> 600	> 1100

[a] For convenience, boiling ranges are interconverted to the nearest 5°F.